

ASSISTANT COMMISSIONER OF PATENTS
Washington, D.C. 20231

07-12-00
DOCKET NUMBER: GB9-2000-0017-US1

Sir:

Transmitted herewith for filing is the Patent Application of:

Inventor(s): Brian Innes

For: DATABASE SYNCHRONISATION FOR MOBILE COMPUTING DEVICES

Enclosed are:

☒ Patent Specification and Declaration

☒ 7 sheets of drawing(s)

☒ An assignment of the invention to International Business Machines Corporation (includes Recordation Form Cover Sheet)

☒ A certified copy of a United Kingdom application filed on 24 February 2000, Serial Number 0004327.3

☐ Information Disclosure Statement, PTO 1449 and copies of references

The fee has been calculated as shown below:

For	Number Filed	Number Extra	Rate	Fee \$
Basic Fee				\$ 690.00
Total Claims	23 - 20	3	x 18 =	54.00
Independent Claims	3 - 3		x 78 =	
MULTIPLE DEPENDENT CLAIM PRESENTED			260 =	
TOTAL				\$ 744.00

☒ Please charge my Deposit Account No. 09-0461 in the amount of \$744.00. A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account 09-0461. A duplicate copy of this sheet is enclosed.

☒ Any additional filing fees required under 37 CFR §1.16.

☒ Any patent application processing fees under 37 CFR §1.17.

EXPRESS MAIL CERTIFICATE

Express Mail Label No. EK956411837US

Date of Deposit July 11, 2000

I hereby certify that this paper and fee are being deposited with the United States Postal Service Express Mail Post Office to Addressee service under 37 CFR §1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231. The Applicant and/or Attorney requests the date of deposit as the filing date.

Person mailing paper/fee Dianne Lane

Signature Dianne Lane

Respectfully submitted

Jeanine S. Ray-Yarletts
Registration No.

IBM Corp, IP Law Dept T81/B062,
3039 Cornwallis Road,
PO Box 12195,
Research Triangle Park, NC 27709-2195.
Telephone: (919)543-2541

APPLICATION
FOR
UNITED STATES LETTERS PATENT

INTERNATIONAL BUSINESS MACHINES CORPORATION

DATABASE SYNCHRONISATION FOR MOBILE COMPUTING DEVICESField of the Invention

5 The invention relates generally to database synchronisation for mobile computing devices and in particular to server initiated database synchronisation with a client machine.

Background of the Invention

10 Client/Server distributed computing environments are well known in the art. A central server system, comprising one or more servers, running a plurality of applications, is provided. Multiple client machines may connect to the system in order to retrieve data from one or more of its servers. The clients are physically
15 separate from the server, running their own operating system. Clients typically communicate with the server system via an asynchronous connection using a standard comms protocol such as TCP/IP.

20 It is common for such a system to include a mail server running database application software with email capability such as Lotus Notes, available from the IBM Corporation. The mail server is responsible for
25 receiving the electronic mail addressed to all users registered with it.

Typically the database software comprises a mail database including multiple mailboxes. Each registered user owns one of these mailboxes and mail arriving at the server is automatically deposited in the appropriate box.

5 Each client machine runs software (eg Lotus Notes) allowing a user to access mail, work with it, and to compose their own emails. Such software may also provide added functionality, for example a calendar, an address book etc.

10 Co-pending European patent application number 97300435.1 (IBM docket number UK9-96-015) is primarily concerned with voice mail and discloses a Java applet running on a client machine with an Internet connection to a mail server. The applet continually polls the server to see whether any mail has been received for that machine. Upon receipt of mail at the server, the client's applet detects this and notifies the user of the new message. The application also suggests that it might

15 Be possible for the server to initiate such mail notification. In any event, after such notification it is then the responsibility of the user to contact the server to access the new message.

25 It is also known that mobile phones are often capable of receiving SMS text messages. These are automatically transferred by a messaging server to the appropriate phone. This functionality, however, is

provided as part of the network infrastructure and so is limited to phones supported by and within the geographical range of that infrastructure. It is generally suitable for short text messages only,
5 otherwise the network protocol becomes too complex. The SMS may not be compatible with other mailboxes from different applications belonging to the user.

10 One problem with the simple client/server model described above is that if the server is particularly busy or the network congested then response times can become unacceptably poor. Users reliant on accessing the server's mail database in order to work with their mail can be frustrated by the amount of time they waste whilst
15 waiting for operations to complete.

20 One solution supported by some email programs such as Lotus Notes is for each user to store a copy of their mail database on their local machine. A user manipulates their mail locally and only connects to the server in order to send and receive mail. Thus improved response times are observed. Any changes made to the server copy of the user's mailbox have to be reflected in their local mail database and vice versa. Updates have to be
25 performed and any conflicts resolved. Thus when mail is received at the server, this change has to be replicated across to the corresponding user's local mail database (ie synchronisation performed). Likewise when a user

sends mail or updates their calendar/address book, the changes have to be reflected at the server-end. The software enabling a user to synchronise (ie replicate) their local database with the server's mailbox is generally part of the functionality of the email application itself (as with Lotus Notes).

Lotus Notes permits automated replication to be scheduled to occur with the server at a predetermined frequency. If there is new mail, the user is informed by means of an alert message "you have new mail" which appears as a popup message. This message is received as a result of the client machine polling the server at a predetermined frequency. In this system, if a user is waiting for an important piece of mail it is necessary for them to continually connect to the server either for direct access or by repeated replication, or to set a high polling frequency.

Further problems exist where the local copy of the database is maintained on a mobile computing device. Such devices may include personal digital assistants (PDAs), palmtops, notepads, laptop computers and mobile phones with advanced computational facilities. Such devices have no fixed connection to the server, and so have to specifically dialup the server in order to synchronise their local copy with the corresponding mailbox held on the server and then disconnect.

Thus a user of one of these mobile computing devices who is expecting an important piece of mail may have to dial up numerous times within a short period of time in order to replicate with the server. Often there will be no new mail and thus such a replication will result in no change to the local copy of the mail. Repeated replication is distracting and invariably proves a waste of time and resources.

Disclosure of the Invention

Accordingly the invention provides a method for performing server initiated database synchronisation between a mail server and a client on a mobile computing device, comprising the steps of: providing the mail server and the client each with a copy of a user mailbox; receiving a message for said user at said mail server; storing the message in said user mailbox on said mail server; responsive to receipt of said message at the mail server, initiating a link between said mail server and said client; and synchronising the client copy of said mailbox with the mail server copy such that said message is added to the client copy of the mailbox.

The use of pervasive devices, for example palmtops, notebooks, notepads, laptops, personal digital assistants (PDAs) and intelligent mobile phones, is on the increase. Such remote mobile devices are frequently used to retrieve mail from a mail server, however they have no

fixed connection to that mail server. Rather than a user having to specifically dialup the server in order to synchronise their local mailbox and then disconnect, in accordance with the present invention it is the server which initiates communications with the client. Time is not wasted repeatedly dialling up the server just in case a new piece of mail has arrived. Expense is also minimised and network traffic reduced. Urgent data is received at a client device automatically and in a timely manner, without having to wait for the next time the client connects.

According to a preferred embodiment, the mail server copy of the mailbox includes a remote device id for identifying the client. The mail server contacts the client via an intermediary message server which includes an address book containing the remote device id of the client and its corresponding contact details (ie a telephone number). The client is able to update the telephone number and this allows the client device to use whatever telephony facilities happen to be available locally (for example, a laptop with modem may be connected to a conventional telephone line in any given office). The message server acts as a generic routing mechanism and may either be totally separate from the mail server or the two may be combined, depending on respective system loads, application management

considerations, physical location of computing resources, etc.

In the preferred embodiment, the connection with the client is initiated via an agent, running on the mail server, using the remote device id. The agent creates a trigger message including the remote id and transmits this to the message server. The message server is then responsible for looking up the remote id within its address book and obtaining this to the corresponding address of the client device. This address is subsequently used by the message server to transmit a second trigger message to the client causing the client to initiate a link with that message server. The message server then sends a synchronisation request over this link and receipt of such a request at the client causes it perform mail database synchronisation. Once the second trigger message has caused the client to establish a link with the message server, that link may be used to send further requests to the client. These may prompt the client to perform any number of tasks. Note that this link will typically be into a general portal for a company network (intranet), thereby allowing the client machine to make direct contact with both the message server and the mail server over this network.

The reason for this approach is that certain remote mobile devices do not support receipt of high-level

protocol inbound calls. In one preferred embodiment, the client device is initially contacted via a serial link and it can then set up a second call, this time outbound, in order to provide a high-level protocol communications session (eg a TCP/IP session) with the mail and message server. This solution enables the client device to make use of commercially available software in order to perform the synchronisation using a TCP/IP session.

It will be appreciated that in other embodiments only a single link between the client and server may be required, where synchronisation can easily be performed over the initial inbound link to the client. Of course, if the message server and mail server are not both contactable through the same network portal, then again separate links may be required to first receive the trigger message, and secondly to perform the synchronisation (unless the message server becomes directly involved in the synchronisation process itself, although this would probably represent a more complicated approach).

In an alternative embodiment the caller id of a known server, with respect to an incoming call, can be used effectively as the second trigger message to prompt the client to initiate synchronisation with the mail server. It is also possible for the server to use an SMS message to the client to prompt the synchronisation.

This has the added advantage that such messages will be queued if the remote device is switched off for future delivery.

5 It will be appreciated that the use of the message server in the preferred embodiment is architecturally convenient, to provide a platform which also supports more general messaging with the PDA. However, in some
10 embodiments it may be preferable to roll up the functionality of the message server into the agent on the mail server, or even into the standard operation of the mail database system itself.

 According to the preferred embodiment, it is possible for a user to disable server initiated database
15 synchronisation with the client by transmitting a null device id to the mail server, although other approaches, such as setting a simple flag, could also be used. It is also possible to log when synchronisation was last
20 performed so that it is not performed again for a predetermined amount of time. Preferably the user is able to modify this setting. This is beneficial since a user may receive a batch of mail, each message arriving within minutes of the next. It is costly and
25 distracting, not to mention a waste of resources, for the client to synchronise with the mail server receipt of each piece of mail at that server.

The invention further provides a mail server for initiating database synchronisation with a client on a mobile computing device, comprising:

a mail server copy of a user mailbox, wherein a copy
5 of said user mailbox also exists on the client;

means for receiving a message for said user at the mail server;

means for storing the message in said user mailbox on the mail server;

10 means, responsive to receipt of said message at the mail server, for initiating a link between the mail server and the client; and

means for transmitting synchronisation updates to the client in order to synchronise the client copy of
15 said mailbox with the mail server copy, such that said message is added to the client copy of the mailbox.

The invention further provides a mobile computing device including a copy of a user mailbox, wherein said
20 copy corresponds to a user mailbox on a mail server, said server performing server initiated database synchronisation upon receipt of a message for the user at said mail server, said device comprising:

means for detecting a call from the mail server;

25 means, responsive to detecting said call, for initiating a link with the mail server; and

means for receiving synchronisation updates from the mail server in order to synchronise the client copy of

said mailbox with the mail server copy such that said message is added to the client copy of the mailbox.

Brief Description of the Drawings

5 A preferred embodiment of the present invention will now be described in detail, by way of example only, and with reference to the following drawings:

Figure 1 is a high level diagram of the operating environment of a preferred embodiment of the invention;

10 Figure 2 illustrates at a high level the operation of a preferred embodiment of the present invention;

Figure 3a shows in more detail a preferred embodiment of the server-end of Figure 1;

Figure 3b shows the SAFE application in more detail;

15 Figure 4 depicts the operation at the server-end of Figure 3a according to one embodiment of the present invention;

20 Figure 5 is a component diagram of the software running on a personal digital assistant (PDA) in accordance with a preferred embodiment of the present invention; and

Figure 6 illustrates the operation of the PDA upon receipt of a second trigger message.

Description of the Preferred Embodiments

25 With reference to figure 1, a server 10, runs an operating system 20. According to the preferred embodiment, the server sits within an enterprise network

and can, for example, be from the IBM RISC System/6000 family, running in conjunction with the IBM AIX operating system.

5 On top of the operating system runs database application software 30. In the example, this is Lotus Notes, available from the IBM Corporation. Within the Lotus Notes environment sits a mail database 35, comprising a plurality of mailboxes (two shown) 40, 41. 10 Each mailbox is associated with a particular user. Upon receipt of an email 45 by server 10, the email 45 is then transferred to the mailbox belonging to the user to whom the email is addressed (in this case mailbox 140).

15 Each Lotus Notes mailbox is based upon a standard definable template. It is possible to modify the base template definition and any changes are then inherited by all mailboxes. According to the preferred embodiment, the template is such that an agent (small program or 20 macro) is run upon receipt of each mail message, and also includes a mailbox preference to allow a user, owning that box, to complete a field (not shown) indicating a remote mobile computer device. The agent 50 is responsible for creating a trigger message 60 for 25 transmittal across a network 100 to the specified mobile computer device 70. A SAFE application 130 (communications software) also runs on the mail server and the agent passes the trigger message to SAFE which

then arranges for the transmittal across the network 100. The network may be, for example, a mobile telephone network or the Public Switched Telephone Network (PSTN) etc, and in one preferred embodiment the mobile computer device is a personal digital assistant (eg a Psion Netbook, available from Psion PLC). Note, the PDA does not have a permanent connection to the server 10.

The PDA also runs a SAFE application 130 to receive the trigger message and an operating system 80, which in the preferred embodiment is EPOC from the Symbian Corporation. The operating system includes a mail client 90, with a mail box 40A. The mail box 40A is the PDA user's copy of the mailbox 40 sitting on the server 10. The PDA also includes mail synchronisation software 110 which when activated dials up the server and performs synchronisation, as will be described in more detail below.

Figure 2 illustrates at a high level the operation of the invention according to a preferred embodiment and should be read in conjunction with Figure 1.

Mailbox 40 receives email 45 (step 200) and this causes the agent 50 to be initiated (step 210). If the remote device field associated with the mailbox 40 is null (ie nothing specified) then the agent terminates (step 215). Otherwise the agent creates a trigger

message 60 (step 230) which is transmitted to the corresponding PDA at step 240. The agent then terminates (step 250). The receipt of the trigger message at the PDA (step 260) causes the synchronisation program 110 to launch (step 270) (if not already running). Synchronisation is then performed, resulting in a copy of the mail from the server being received by the client (step 280).

Figure 3a shows in more detail a preferred embodiment of the server-end of Figure 1. The server is split into two components, a mail server 10 and a message server 120. These may be physically on the same machine or on separate machines with an appropriate network link between them. The mail server 10 has already been described with reference to figure 1, however this time the field including a remote device id 39 is also shown for mailbox 40. As previously described, agent 50 is activated upon receipt of an incoming message to mailbox 40, and assuming that remote device id field 39 is not blank, the agent creates and passes, via SAFE, a trigger message 60 to the message server 120. The trigger message includes remote device id 39.

The message server 120 is responsible for routing a second trigger message 61 across network 100 to the PDA corresponding to the user mailbox (shown in Figure 1). The server 120 also runs a SAFE application 130.

Figure 3b shows the SAFE application in more detail and should be read in conjunction with figure 3a and figures 4 to 6. The SAFE application maintains a registry 140, which stores two sets of data, the first relating to devices and the second relating to applications. When an application is executed on a machine running the SAFE application, it registers itself with the application part 146 of the registry. When an application on a machine requests SAFE to deliver a message, the SAFE application first checks whether it recognises the device to which the message is addressed. If not the message is automatically sent to the SAFE application designated "HOME" which in the present embodiment is SAFE running on the message server. The HOME SAFE application essentially provides a centralised routing facility for SAFE messages from the other systems.

A device (eg a PDA) with network connectivity enabled via, for example, a dialup modem connection can register itself with the devices portion 145 of the HOME registry 140. A PDA user can specify contact details (eg the telephone number of the PDA) as part of a configuration on the remote device (not shown) and then the first time the device dials in to the message server this information is transferred across to the server's registry. This HOME registry maps the PDA's device id to the corresponding contact details. It is also possible

using the PDA to remove the device id from the HOME registry 140. SAFE applications running on machines other than the HOME system need only store device information to allow them to contact their HOME system as required.

A message queuing (MQ) application 150 (see figure 3b) also runs within SAFE on the message server 120 and according to the preferred embodiment this is the MQ Series application, available from the IBM Corporation. The MQ application provides reliable delivery of messages from a SAFE application on one machine to a SAFE application on another machine. When a message is transmitted using the MQ application, a copy of it sits on a queue (not shown) until confirmation of receipt is received from the device to which it has been sent. The application therefore ensures reliable delivery of messages. Furthermore the MQ application may also have encryption and compression capabilities etc.

The operation at the server-end of Figure 3a is shown in Figure 4, according to one embodiment of the present invention, which should be read in conjunction with Figures 3a and 3b.

Agent 50 passes the trigger message 60 including the remote device id to the SAFE application 130, running on the mail server (step 450) and then terminates at step

455. SAFE determines that it is not the device to which the message is addressed and therefore transmits the trigger message 60 to the HOME SAFE application 130 running on the message server 120 (step 460). Note, the trigger message contains a request to perform mail synchronisation. The HOME SAFE application 130, looks up the address (ie typically a telephone number) of the device id in the devices portion 145 of the HOME registry 140 (step 470). A timer also runs on the message server (not shown in figure 3a). This is used at step 470 to check when the message server last called the remote computing device. According to the preferred embodiment, if it did so within a configurable time period, then the message server waits until the expiry of such time period (step 475) before initiating a link at step 480 with the PDA. Note, this setting can be performed in similar fashion to the configuration of the device ID described earlier and in the example the aforementioned time period is 20 minutes.

Otherwise, a link is initiated immediately. This link is based on the contact information retrieved from the HOME registry at step 465. Note, if the device id is not found then this can be logged and the whole process terminated.

Thus, the PDA device can send messages to the server in order to update the device id 39 and timer setting.

The PDA transmits such a message by dialling into the server. As previously mentioned, it can also disable the service altogether by transmitting a null device id 39.

5 In order to initiate the link, a second trigger message containing the keyword "SAFE" is transmitted to the SAFE application 130, running on the PDA. As described in more detail below, the initial link is then dropped and a second link formed from the PDA back to the message server. This allows a second connection to be formed between the SAFE applications running on both the message server and the PDA. The message server then uses the MQ application to transmit the synchronisation request, via the SAFE application, to the PDA at step 490.

10 The reason for this approach is that as described in more detail below, communications capabilities are limited on a PDA. In particular, the PDA can only setup TCP/IP communications as used by MQ for outbound calls. In contrast, for inbound calls only a simple serial protocol is supported. Therefore the MQ application is not actually used for initial delivery of the second trigger message from the message server to the PDA. Rather, this is transmitted to the PDA by the SAFE application itself using the basic serial protocol. Since the second trigger message contains simply the keyword "SAFE", and given the further processing

described below, the absence of complete reliability in terms of delivery of the second trigger message is not significant.

5 Figure 5 is a component diagram of the software running on a PDA 70 in accordance with a preferred embodiment of the present invention. The PDA runs the EPOC operating system 80 which includes an ETEL component 95. The ETEL software is responsible for detecting an
10 incoming call, for answering it, and for determining whether the call is voice, FAX, or data.

Also within the operating system sits Comms software 85. When an incoming call from the message server is received responsive to step 480 in figure 4, this
15 establishes a serial data connection between the Comms software and the HOME SAFE application. The Comms software is responsible for receiving data over this connection including the second trigger message, which it
20 then passes to Comms Manager 165. Comms Manager identifies the second trigger message by means of the keyword "SAFE" and notifies a SAFE application 130, running on the PDA. The call is then dropped and the
SAFE application initiates a second call back to the HOME
25 SAFE application on the message server. Because this is an outbound call, the SAFE applications can now set up a TCP/IP link and talk to each other using MQ.

The PDA also runs mail software for receiving, sending, working with emails etc (shown in figure 1). This is provided with the operating system 80 and includes mailbox 40A. Given the resource constraints on PDA 70, it does not make sense to also install a separate mail program to act as a client to the mail server database 35, complete with local mailbox replica. Rather, the PDA includes the Mobile Connect application, available from the IBM Corporation, which allows the operating system mailbox 40A on PDA 70 to effectively function as a replica of mailbox 40 on mail server 10. Thus Mobile Connect can be used to perform "synchronisation" between mailbox 40A on PDA 70 and mailbox 40, in which case Mobile Connect performs any necessary format conversion, as well as truncating mail from the server if it exceeds a predetermined size due to storage limitations on PDA 70. In this manner mailbox 40A on PDA 70 appears to the user as a local replica of mailbox 40 on mail server 10.

Once the second connection has been established, the message server sends a synchronisation request to the PDA. This is then passed to Comms Manager which notifies the SAFE application, running on the PDA. The SAFE application 130 again includes a MQ application and a registry (as shown in figure 3b). The SAFE application verifies, via its registry, whether a Mobile Connect (MC)

program 110 is running and if not it launches this program.

5 Once it is confirmed that the Mobile Client is running or has been launched, the SAFE application notifies the incoming message to EPOC Connect, which in turn causes EPOC Connect to pass a command to Mobile Connect prompting it to set up a communications link with the mail server in order to perform mail database
10 synchronisation. Such synchronisation is part of the standard known operation of Mobile Connect and accordingly will not be described further here. Note, EPOC Connect and Comms Manager are essentially part of the overall SAFE application but are platform dependent, and so are separate processes in order to allow the main
15 SAFE application 130 to retain platform independence.

20 Figure 6 illustrates the operation of the PDA upon receipt of the second trigger message (corresponding essentially to steps 260-280 in figure 2). According to the preferred embodiment, the message server initiates a call to the PDA 70. ETEL 95 detects an incoming call (not shown) and if this is a data call (as opposed to voice or FAX) it notifies Comms 85 (step 600). Comms
25 then attaches to the call (step 610) and is then responsible for receiving the "SAFE" second trigger message (step 620). The second trigger message is then passed to Comms Manager 165 which identifies the "SAFE"

keyword and the call is dropped (step 625). Note, if the second trigger message is not received within a given period of time then the call is also dropped.

5 The Comms Manager then notifies the SAFE application that the second trigger message has been received (step 630), and SAFE initiates a second call to the message server to establish a second link (step 635). The original synchronisation request from the mail database is then transmitted by the message server to the PDA (this time using the MQ application) over this second link (step 640). The Comms software receives this (step 645) and passes it to Comms Manager (step 650). The message is notified to the SAFE application (step 655) which checks whether Mobile Connect is running using its registry and if not Mobile Connect is launched. SAFE then passes a command to EPOC Connect at step 660, which prompts it to request Mobile Connect to perform mail database synchronisation at step 665. Mobile Connect sets up a call from the PDA to the server 10 (step 670) and completes the synchronisation process in known fashion (step 680). The overall outcome of this is that the new message that arrived in user mailbox 40 on the mail server has now been transferred to the local copy of the mailbox on PDA 70.

25 The skilled person will be aware that many variations and enhancements to the above processing are

possible, of which an exemplary selection will now be described.

Although the preferred embodiment has been described
5 in terms of two separate servers (ie a mail server and a message server), this configuration is for convenience only. In an alternative embodiment the functionality of the message server may be included in the agent program on the mail server. In other words, the agent program
10 itself would directly set up the link to the PDA, without using the message server as an intermediary. The advantage of the preferred embodiment however is that the message server in fact provides a generic mechanism for contacting the PDA which can then be used for tasks other than mailbox synchronisation.
15

It will also be appreciated that the messaging
structure of the preferred embodiment (ie the use of the first and second trigger messages followed by the
20 synchronisation request) is determined firstly by communications limitations of the PDA, and secondly by a desire to use existing software, especially the MQ Series and Mobile Connect applications. However many variations are possible. For example, some mobile devices may
25 accept TCP/IP communications on an inbound call in which case only the first initial link would need to be established. Alternatively, it might be possible to

perform the synchronisation itself over a serial link, so that again only the first initial link would be needed.

5 It will further be appreciated that the second trigger message could be used to trigger synchronisation directly rather than waiting for the subsequent synchronisation request. The reason for having a separate synchronisation request is that it allows (in principle) other forms of request to be sent, and so
10 provides a more generic solution.

Although the preferred embodiment uses a specific keyword in the trigger message, there are many other possibilities, such as using caller id from the server. Thus if the number of a known server is recognised with respect to an incoming call, then this could cause Comms Manager to prompt Mobile Connect to perform
15 synchronisation with the server. Alternatively, the server might use an SMS message to the PDA to prompt synchronisation. This has the added advantage that such messages will be queued if the PDA is switched off for future delivery. It will be appreciated that both of these approaches are possible independent of whether the mail server contacts the PDA directly, or whether it uses
20 a message server as an intermediary. On the other hand, communication with the client via a basic serial protocol as in the preferred embodiment implies the solution is

25

not limited to a specific infrastructure, unlike GSM SMS messages, and so can work internationally.

Furthermore, although the preferred embodiment has
5 been described in terms of synchronisation with a single mobile computing device, the invention is not limited to such. It is possible to specify multiple device ids in mailbox 40 on mail server 10 and for synchronisation to be initiated with all corresponding remote devices upon
10 receipt of a new mail message.

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203
2204
2205
2206
2207
2208
2209
2210
2211

What is claimed is:

1. A method for performing server initiated database
synchronisation between a mail server and a client on a
mobile computing device, comprising the steps of:

providing the mail server and the client each with a
copy of a user mailbox;

receiving a message for said user at said mail
server;

storing the message in said user mailbox on said
mail server;

responsive to receipt of said message at the mail
server, initiating a link between said mail server and
said client; and

synchronising the client copy of said mailbox with
the mail server copy such that said message is added to
the client copy of the mailbox.

2. The method of claim 1, wherein the mail server copy
of the mailbox includes a remote device id for
identifying the client.

3. The method of claim 2, wherein the step of
initiating a link to said client comprises executing an
agent, wherein the agent initiates a call to the client
using said remote device id.

4. The method of claim 3, wherein the agent initiates the call to the client by:

creating a trigger message, said trigger message comprising the remote device id;

5 transmitting said trigger message to a message server; and

responsive to receipt of said trigger message at the message server, initiating said link between the mail server and the client in order to perform said
10 synchronisation.

5. The method of claim 4, wherein said message server includes an address book, in which the remote device id of the client and contact details are stored.

6. The method of claim 5, wherein the step of initiating a link to the client further comprises:

receiving the trigger message at said message server;

20 looking up the remote device id contained within said trigger message in the message server's address book;

mapping said remote device id to the corresponding contact details; and

25 using said details to transmit a second trigger message to the client.

7. The method of claim 6 wherein a first link is established between the client and the message server to allow receipt of said second trigger message by the client, said method further comprising the steps of:

5 dropping said first link after receipt of said second trigger message at the client;

 initiating a second link from the client to the message server; and

10 transmitting a synchronisation request over said second link from the message server to the client, wherein said synchronisation is performed in response to receipt of said request at the client.

8. The method of claim 6, wherein the second trigger message is an SMS text message.

9. The method of claim 4, wherein the mail server and the message server are physically the same machine.

20 10. The method of claim 1, further comprising the step of allowing a user to disable server initiated database synchronisation with the client.

25 11. The method of claim 1, comprising the steps of:
 logging when synchronisation was last performed; and
 responsive to receipt of a new message for the user at the mail server, waiting a predetermined amount of

time after said synchronisation was last performed before performing synchronisation again.

12. The method of claim 11, further comprising the step of enabling a user to alter said predetermined amount of time.

13. A mail server for initiating database synchronisation with a client on a mobile computing device, comprising:

a mail server copy of a user mailbox, wherein a copy of said user mailbox also exists on the client;

means for receiving a message for said user at the mail server;

means for storing the message in said user mailbox on the mail server;

means, responsive to receipt of said message at the mail server, for initiating a link between the mail server and the client; and

means for transmitting synchronisation updates to the client in order to synchronise the client copy of said mailbox with the mail server copy, such that said message is added to the client copy of the mailbox.

14. The mail server of claim 13, wherein the mail server copy of the mailbox includes a remote device id for identifying the client.

15. The mail server of claim 14, wherein the means for initiating a link to said client comprises an agent which initiates a call to the client using said remote device id.

5

16. The mail server of claim 15, wherein the mail server further includes a message server, and wherein the agent initiates the call to the client by creating a trigger message, said trigger message including the remote device id, and by transmitting said trigger message to the message server, said message server including means responsive to receipt of said trigger message for initiating said link between the mail server and the client in order to perform said synchronisation.

10

17. The mail server of claim 16, wherein said message server includes an address book, in which the remote device id of the client and contact details are stored.

15

18. The mail server of claim 17, wherein the message server further comprises:

20

means for receiving the trigger message;

means for looking up the remote device id contained within said trigger message in the message server's address book;

25

means for mapping said remote device id to the corresponding contact details; and

means for using said details to transmit a second trigger message to the client.

19. The mail server of claim 18, wherein the second
5 trigger message is an SMS text message.

20. The mail server of claim 13, further comprising
means for allowing a user to disable server initiated
database synchronisation with the client.

10 21. The mail server of claim 13, further comprising:
a log of when synchronisation was last performed;
and

means responsive to receipt of a new message for the
user at the mail server, for waiting a predetermined
15 amount of time after synchronisation was last performed
before performing synchronisation again.

22. The mail server of claim 21, further comprising
means for enabling a user to alter said predetermined
20 amount of time.

23. A mobile computing device including a copy of a user
mailbox, wherein said copy corresponds to a user mailbox
25 on a mail server, said server performing server initiated
database synchronisation upon receipt of a message for
the user at said mail server, said device comprising:
means for detecting a call from the mail server;

means, responsive to detecting said call, for
initiating a link with the mail server; and

means for receiving synchronisation updates from the
mail server in order to synchronise the client copy of
said mailbox with the mail server copy such that said
message is added to the client copy of the mailbox.

5

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32

ABSTRACT OF THE DISCLOSURE

The invention relates to performing server initiated database synchronisation between a mail server 10 and a client on a mobile computing device 70. Both the mail server and the client are provided with a copy of a user mailbox 40, 40A. When a message for that user is received at the mail server, this is stored in their server mailbox. The mail server then initiates a link with the client and prompts it to dial into the mail server in order to synchronise its local copy of the mailbox with the server copy. In this manner new mail is automatically transferred to the client device upon receipt at the mail server.

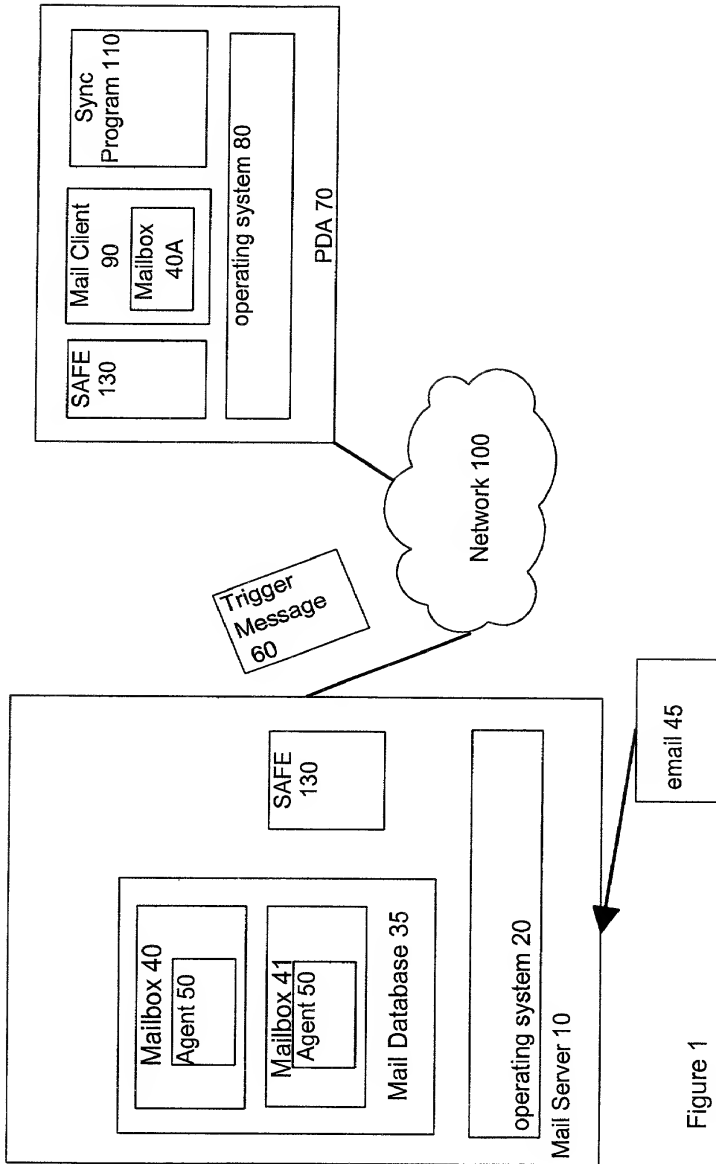


Figure 1

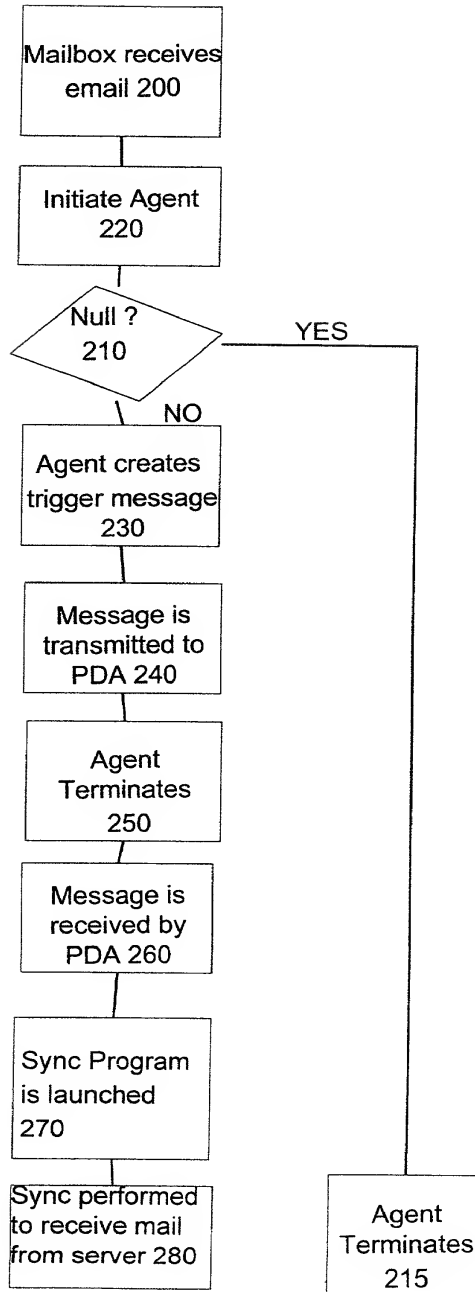


Figure 2

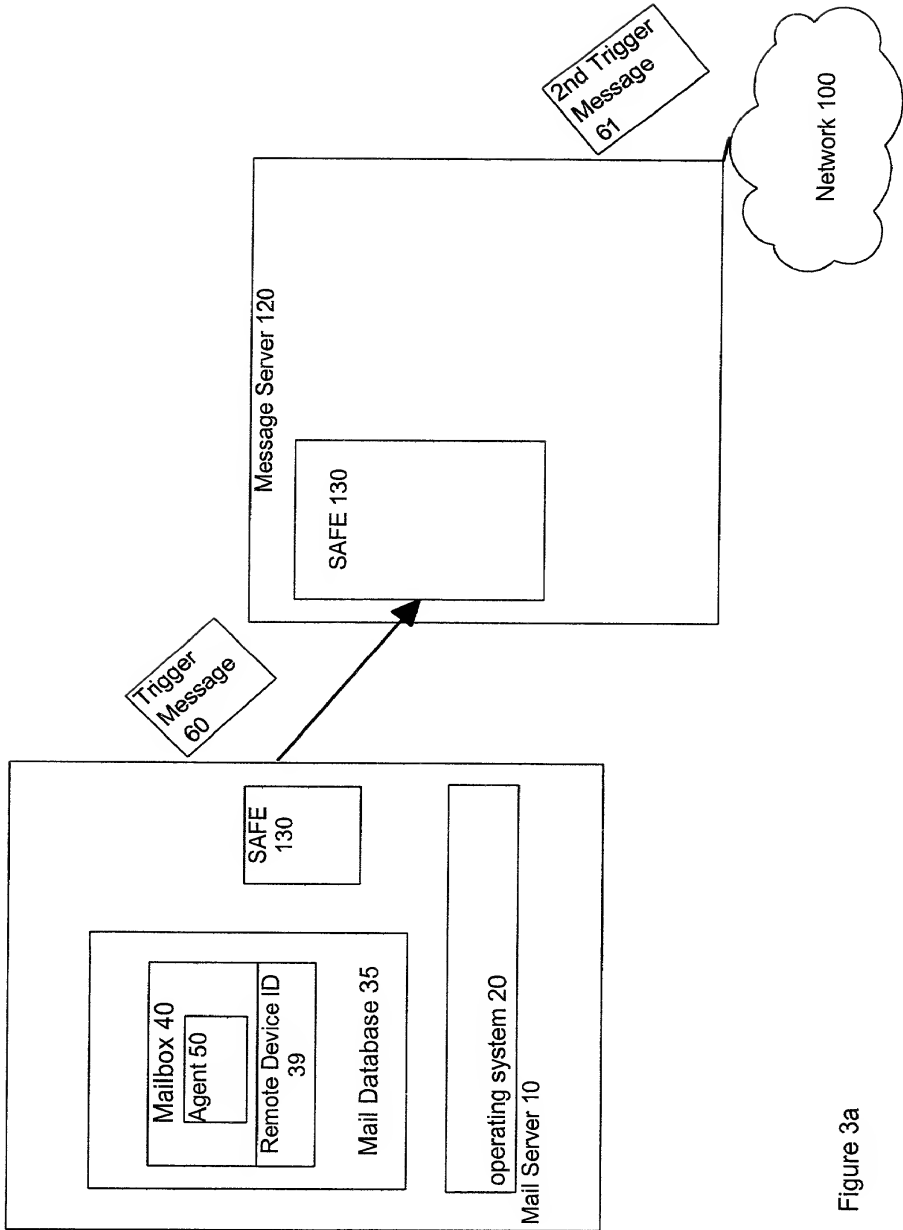


Figure 3a

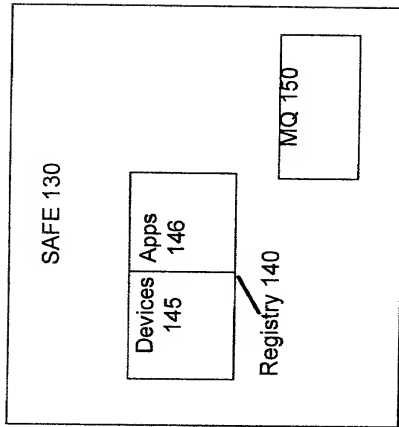


Figure 3b

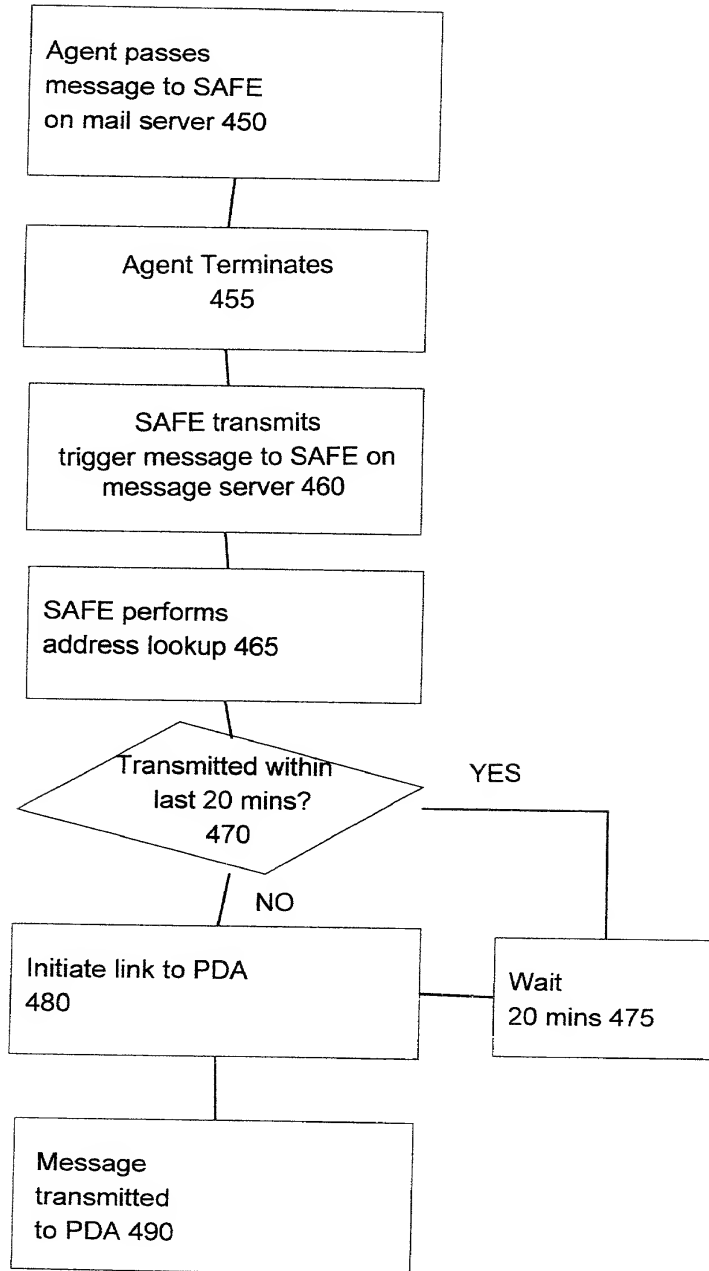


Figure 4

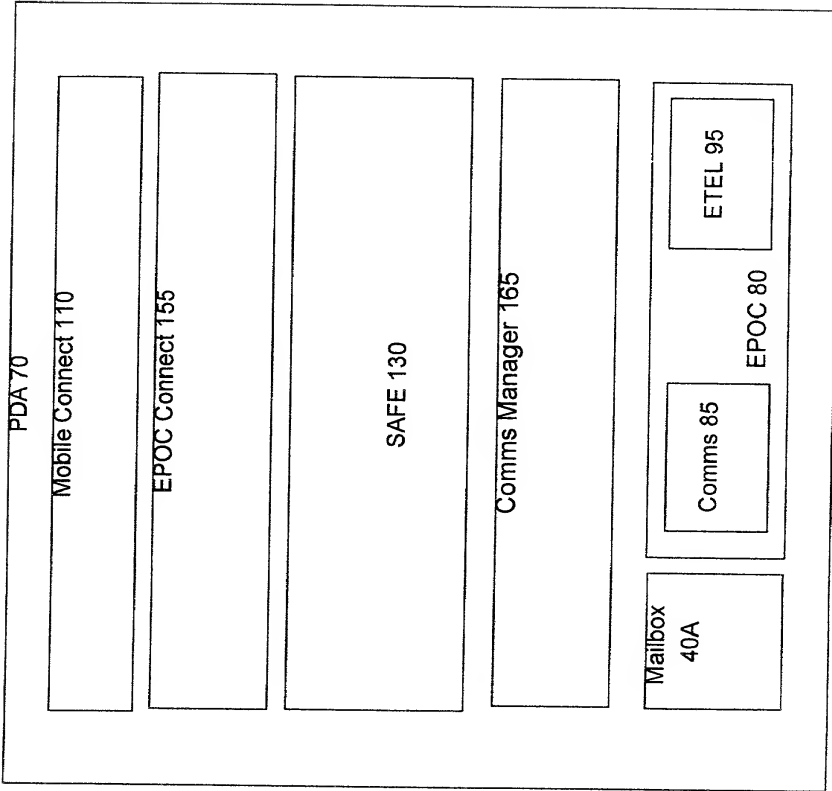


Figure 5

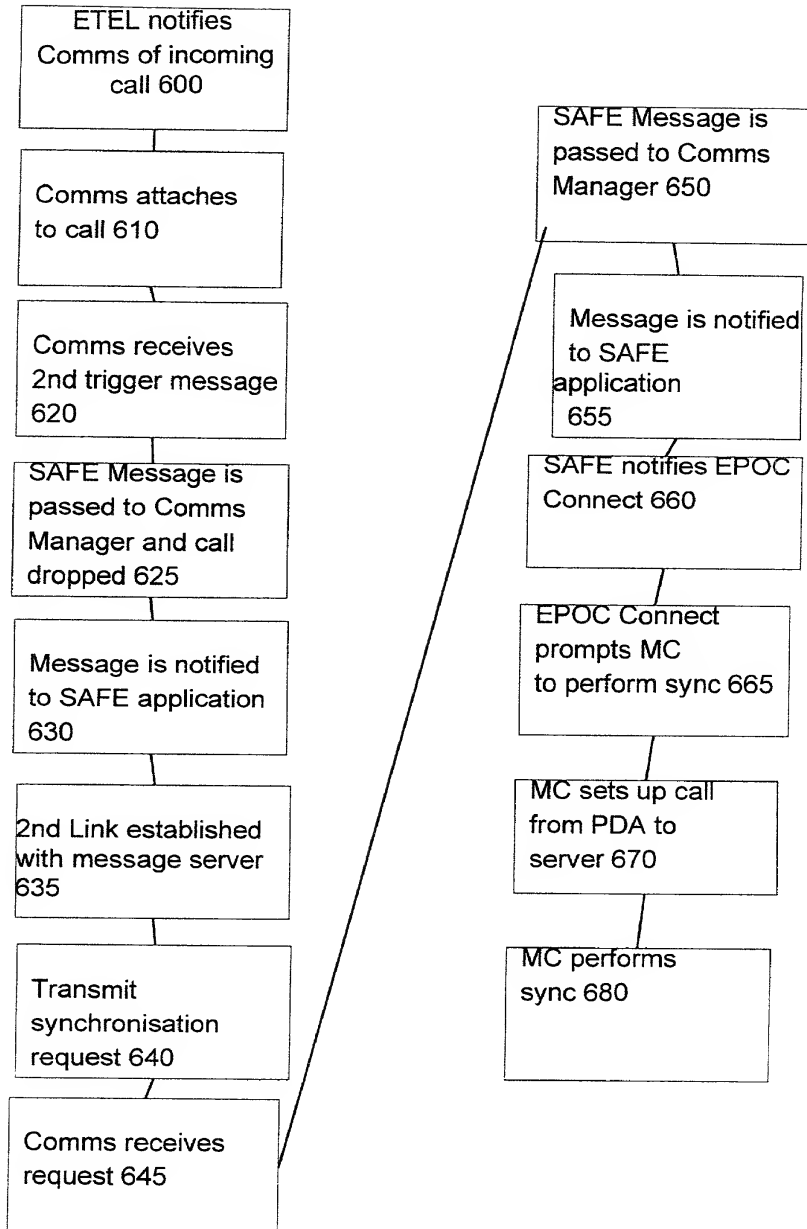


Figure 6

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

Edward H. Duffield, Reg. No. 25,970; A. Bruce Clay, Reg. No. 32,121; Gregory M. Doudnikoff, Reg. No. 32,847; Jeanine S. Ray-Yarletts, Reg. No. 39,808; Jerry W. Herndon, Reg. No. 27,901, Kevin J. Fournier, Reg. No. 34,333

Send all correspondence to:

Jeanine S. Ray-Yarletts
IBM Corp, IP Law Dept T81/B062,
3039 Cornwallis Road,
PO Box 12195,
Research Triangle Park, NC 27709-2195.
Telephone: (919)543-2541

FULL NAME OF SOLE OR FIRST INVENTOR:

Brian Innes

INVENTOR'S SIGNATURE:

 DATE: 28 March 2000

RESIDENCE:

Otterburn, 1A Parley Close, West Parley, Ferndown, Dorset
BH22 8PH, UK

CITIZENSHIP:

British

POST OFFICE ADDRESS:

As above